REMARKS/ARGUMENTS

This is intended as a full and complete response to the Office Action dated January 6, 2010, having a shortened statutory period for response set to expire on April 6, 2010. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-25, 27, 29-33 and 35-42 are pending in the application. Applicants submit that amendments, if made, do not introduce new matter.

Further, Applicants are not conceding in this application that those amended (or canceled) claims are not patentable over the art cited by the Examiner, as the present claim amendments and cancellations are only for facilitating expeditious prosecution of the claimed subject matter. Applicants respectfully reserve the right to pursue these (pre-amended or canceled claims) and other claims in one or more continuations and/or divisional patent applications.

Claim Rejections - 35 U.S.C. § 103

Claims 1-24, 29-32, 35-38 and 40-42 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over *Boros et al.* (U.S. Patent No. 6,654,590, hereinafter, "*Boros*") and *Tellado et al.* (U.S. Publication 2004/0198276, hereinafter, "*Tellado*") and *Hudson* (U.S. Patent No. 7,254,171) further in view of *Keskitalo et al.* (U.S. Patent No. 7,403,748, hereinafter, "*Keskitalo*").

Applicants respectfully traverse these rejections.

The Examiner bears the initial burden of establishing a *prima facie* case of obviousness. See MPEP § 2141. Establishing a *prima facie* case of obviousness begins with first resolving the factual inquiries of *Graham v. John Deere Co.*, 383 U.S. 1 (1966). The factual inquiries are as follows:

(A) determining the scope and content of the prior art;

(B) ascertaining the differences between the claimed invention and the prior art;

(C) resolving the level of ordinary skill in the art; and

(D) considering any objective indicia of nonobviousness.

Once the *Graham* factual inquiries are resolved, the Examiner must determine whether the claimed invention would have been obvious to one of ordinary skill in the art.

Applicants respectfully submit that the Examiner has attempted to selectively pick and choose features from a relatively large number (4) of disparate references based on hindsight, given the benefit of the disclosure of the present application, in an attempt to meet the claimed elements. In so doing, Applicants submit that the Examiner has not properly characterized the teachings of the references and, as a result, has failed to ascertain differences between the claimed invention and the prior art.

As an example, the Examiner relies on *Boros* as teaching "forming a calibrated downlink channel and a calibrated uplink channel usable between the first subscriber unit and the second subscriber unit using weighted average calibration vector without performing further calibration." While the Examiner refers to the use of an "average calibration factor" this factor is obtained by performing *separate calibration procedures between an access point and multiple stations*, and then averaging the factor obtained with the multiple calibration procedures (see. col. 19, lines 46-67 cited by the Examiner). There is no teaching, however, of calibrating channels "usable" for peer-to-peer communications, as recited in claim 1.

Paragraph [0120] of the present application described how channels usable for peer-to-peer may be established by user terminals (UTs) that have calibrated with APs:

> In various embodiments of the invention as described herein, peer-peer communication between the various user terminals (UTs or STAs) in the same basic service set (BSS) or different BSSs can be implemented as described below. The UTs or STAs that calibrate with a single access point (AP) are members of a basic service set (BSS). The single access point is a common node to all UTs in the BSS. The calibration methods as described above facilitate the following types of communication:
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> (i) A UT in the BSS can use TX steering to communicate directly with the AP on the uplink (UL) and the AP can use TX steering to communicate with the UTs on the downlink (DL).
>
> (ii) A UT in the BSS can communicate directly with another UT in the same BSS using steering. In this case, this peer-peer communication has to be bootstrapped because neither UT knows the channel between them. In various embodiments, the bootstrap procedure works as follows:
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> - The initiator of the peer-peer link is the designate AP (DAP), and the other UT is the designated UT (DUT).

- The DAP sends MIMO pilot to the DUT along with a request to establish link, which contains the BSS ID plus the DAP ID. The request needs to be sent in a common mode (i.e. Tx diversity).
- The DUT responds by sending back steered MIMO pilot plus an acknowledgement which contains the DUT ID, its BSS ID, and some rate indicator for the DAP to use.
- The DAP can then use steering on the DL and the DUT can use steering on the UL. Rate control and tracking can be accommodated by breaking the transmissions into DL and UL segments with sufficient time between them to allow for processing.

(iii) UTs that belong to one BSS (e.g., BSS1) can steer to UTs that belong to another BSS (e.g., BSS2), even though each has calibrated with a different AP. However, there will be a phase rotation ambiguity (per subband) in this case. This is because the calibration procedure as described above establishes a reference which is unique to the AP it has calibrated with. The reference is a complex constant,

$$\alpha(k, j) = \frac{g_{APTX}(0)}{g_{APRX}(0)}$$

where k is the subband index and j is the AP index and 0 is the index of the reference antenna (e.g., antenna 0) used on the AP. In one embodiment, this constant is common to all UTs in a given BSS, but is independent for different BSSs.

As described in paragraphs [0121] and [0122], by performing the claimed operations and utilizing the correction factors obtained through calibration, the UTs may establish peer-to-peer communications whether they belong to the same BSS (having calibrated with the same AP) or belong to different BSSs (having calibrated with different APs).

The Examiner concedes that *Boros* fails to teach "establishing a direct peer-to-peer communication between the first subscriber set and the second subscriber set" but attempts to rely on a combination of *Tellado* and *Hudson* as teaching this missing element. As submitted in response to the previous Office Action, however, the Examiner's attempt fails for at least the following reasons.

The Examiner refers to paragraphs [0043]-[0046] of *Tellado* as teaching "a method for multiple transmit/receive pairs that establishes communication." While these paragraphs may indeed teach such a method, it is absolutely silent as to peer-to-peer communications between two subscriber sets (stations), and only teaches communications between a base station and subscriber stations.

Further, the Examiner relies on *Hudson* as disclosing "a method for calibrating a peer-to-peer communication channel using MMSE equalized packet spectrum ratio between the first and second subscriber stations." Again, Applicants respectfully submit that *Hudson* fails to teach communications between subscriber stations at all. FIG. 6 of *Hudson*, referred to by the Examiner, shows a single subscriber station (608) communicating with multiple access points (612 and 614).

The Examiner concedes that even if combined, *Boros*, *Tellado* and *Hudson* fail to teach "establishing direct peer-to-peer communication between the first subscriber set and the second subscriber set without further calibration between them" as recited in claim 1.

However, the Examiner refers to yet another reference (*Keskitalo*) in an effort to teach this recited feature. In particular, the Examiner refers to col. 4, line 59 – col. 5 line 19 of *Keskitalo*:

> The at least two selected antennas or beams may be controlled at least in part based on another feedback information received from said receiving means. Thus, the same procedures can be used for transmit diversity and beamforming cases. Only the parameters at the transmission end have to be changed (e.g. redefinition of the received FSMs). In the beamforming case, the feedback control (closed-loop diversity) on the basis of the other feedback information leads to a digital or stepwise beamforming. Thus, the advantages of digital beamforming (e.g. reduced cusping loss due to elimination of fixed beam worst case) can be obtained without the need of calibration at the transmitting end.
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> Since the feedback information and the other feedback information can be signaled using existing functions of the receiving user equipment (e.g. mobile station), the user equipments do not have to be modified, at least not to a large extent. The receiver even does not have to know which kind of antenna control is performed. Thereby, diversity and antenna gain can be adapted to different propagation environments. In micro cell environments (i.e. small cell areas), diversity is preferred due to the small delay spread and typically large angular spread of the mobile stations located in the corresponding cell area. In macro cell environments (i.e. large cell areas), the radio channel typically provides "enough" path-diversity, such that capacity and coverage improvements can be achieved by a beamforming operation (i.e. increasing the antenna gain e.g. by directing the transmission beam towards the mobile station).

Applicants respectfully submit, however, that this section only teaches that in a particular scenario calibration may not be needed "at the transmitting end" it does not teach "establishing direct peer-to-peer communication between the first subscriber set and the second subscriber set without further calibration between them" as it does not teach calibration is not needed at the receiving end. Regardless, however, the Examiner ignores that claim 1 recites that the peer-to-peer communication is established between two subscriber sets whose uplink and downlink channels are calibrated based on *first and second sets of correction factors determined based on estimates of downlink and uplink channel responses between the first and second sets (e.g., as determined at the access point).*

As none of the references, even if combined as suggested in the Office Action, teach calibrating uplink and downlink channels for use in peer-to-peer communications between first and second subscriber sets or establishing peer-to-peer communications between the subscriber sets, as recited in claim 1. Claims 18, 24, 40, 41 and 42 recite similar elements for direct communication between subscriber sets that are not taught in the references.

Therefore, Applicants submit claims 1, 18, 24, 40, 41 and 42, as well as their dependents, are allowable over the art of record and respectfully submit withdrawal of this rejection.

Claims 25 and 27 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over *Mesecher et al.* (U.S. Patent No. 6,278,726, hereinafter, "*Mesecher*") and *Keskitalo* further in view of *Hudson*.

Once again, Applicants respectfully submit that the Examiner has attempted to selectively pick and choose features from a relatively large number (4) of disparate references based on hindsight, given the benefit of the disclosure of the present application, in an attempt to meet the claimed elements. In so doing, Applicants submit that the Examiner has not properly characterized the teachings of the references and, as a result, has failed to ascertain differences between the claimed invention and the prior art.

For example, the Examiner relies on *Mesecher* as teaching "a receive (RX) spatial processor operative to receive a second pilot on a downlink channel and derive an estimate of a downlink channel response based on the received second pilot, and to receive an estimate of an uplink channel response derived based on the transmitted first pilot; and a controller operative to

determine first and second sets of correction factors based on the estimates of the downlink and uplink channel responses, wherein a calibrated downlink channel is formed by using the first set of correction factors for the downlink channel and a calibrated uplink channel is formed by using the second set of correction factors for the uplink channel."

Applicants respectfully submit, however, that there is no teaching in *Mesecher* of "receiving an estimate of an uplink channel response derived based on the transmitted first pilot" as recited in the claims. While the Examiner refers to column 6, lines 41-67 as teaching this element, the cited section only teaches utilizing reciprocity, such that weights determined by a base stations receiver are used by its transmitter:

> In a system using the same frequency for downlink and uplink signals, such as time division duplex (TDD), an alternate embodiment is used. Due to reciprocity, downlink signals experience the same multipath environment as uplink signals send over the same frequency. To take advantage of reciprocity, the weights determined by the base station's receiver are applied to the base station's transmitter. In such a system, the base station's receiving circuit of FIG. 18 is co-located, such as within a base station, with the transmitting circuit of FIG. 19.
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> In the receiving circuit of FIG. 18, each antenna 48-52 receives a respective pilot signal sent by the UE. Each pilot is filtered by a RAKE 406-410 and weighted by a weighting device 412-416. The weighted and filtered pilot signals are combined by a combiner 418. Using the error signal generator 420 and the weight adjustment device 422, the weights associated with the weighting devices 412-416 are adjusted using an adaptive algorithm.
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> The transmitting circuit of FIG. 19 has a data signal generator 342 to generate a data signal. The data signal is spread using mixer 384. The spread data signal is weighted by weighting devices 344-348 as were determined by the receiving circuit of FIG. 19 for each virtual channel.
>
> The circuit of FIG. 20 is used as a data signal receiving circuit at the base station. The transmitted data signal is received by the multiple antennas 48-52. A data RAKE 392-396 is coupled to each antenna 48-52 to filter the data signal.

However, there is no teaching of "receiving an estimate of an uplink channel response derived based on the transmitted first pilot" as recited in the claim.

Further, the Examiner concedes that even if combined, *Mesecher* and *Hudson* fail to teach "using spatial processors to transmit pilot signals and receive pilot signals on uplink and

downlink channels for calibration of the channels" as recited in claim 25.

However, the Examiner refers to yet another reference (again, *Keskitalo*) in an effort to teach this recited feature. Applicants respectfully submit, however, that *Keskitalo* fails to teach a user terminal with "a transmit (TX) spatial processor operative to transmit a first pilot on an uplink channel" OR "a receive (RX) spatial processor operative to receive a second pilot on a downlink channel and derive an estimate of a downlink channel response based on the received second pilot, and to receive an estimate of an uplink channel response derived based on the transmitted first pilot" as recited in the claims.

While the Examiner refers to FIG. 3 of *Keskitalo* and the corresponding description, Applicants respectfully submit that the mobile station described therein only receives pilot signals and provides feedback to a multi-antenna base station. There is no teaching that the mobile station has "a transmit (TX) spatial processor operative to transmit a first pilot on an uplink channel." as recited in claim 25.

For at least this reason, Applicants submit that claim 25 and claim 27, which depends from claim 25 is allowable over the art of record and respectfully requests withdrawal of this rejection.

Therefore, the claims are believed to be allowable over the art of record, and allowance of the claims is respectfully requested.

Allowable Subject Matter

Claims 33 and 39 are objected to as being dependent upon a rejected base claim, but would be allowable if re-written in independent form including all of the limitations of the base claim and any intervening claims. Applicants do not wish to re-write these claims at this time, as Applicants believe the base claims are allowable for at least the reasons discussed above.

CONCLUSION

Therefore, for at least the reasons presented above with respect to all of the pending claims subsequent to entry of this response, Applicants assert that all claims are patentably

distinct from all of the art of record. All objections and rejections having been addressed, it is respectfully submitted that this application is in condition for allowance and a Notice to that effect is earnestly solicited. If any points remain in issue that the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Charge Statement: For this application, the Commissioner is hereby authorized to charge any required fees or credit any overpayment to Deposit Account 17-0026.

Respectfully submitted,
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